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REMARKS

This is a full and timely response to the outstanding final Office Action mailed May 16, 2006. Claims 1-36 are pending in the present application. Claims 15-30 were previously withdrawn. Through this response, claims 1 and 10-13 have been amended, and claims 31-36 have been added.

Reconsideration of the application is respectfully requested in view of the following responsive remarks. For the Examiner's convenience and reference, Applicants' remarks are presented in the order in which the corresponding issues were raised in the Office Action.

In the Office Action of May 16, 2006, the following actions were taken:

- (1) Claims 1-6, 9 and 11-13 were rejected under 35 U.S.C. 102(b) and/or 102(e) as being anticipated by U.S. Patent No. 6,921,500 to Feenstra (hereinafter "*Feenstra*") also published as WO01/13815.
- (2) Claims 7-8, 10 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Feenstra*.

It is respectfully submitted that the presently pending claims be examined and allowed. Applicants submit that each and every amendment herein, and throughout the prosecution of the present application is fully supported by the specification as originally filed, and that no new matter has been added.

Claim Rejections - 35 U.S.C. § 102(b)/(e)

Claims 1-6, 9 and 11-13 have been rejected under 35 U.S.C. § 102(b) and/or (e) as being allegedly anticipated by *Feenstra* (U.S. Patent No. 6,921,500 also published as WO01/13815). Applicants respectfully traverse this rejection.

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It is axiomatic that “[a]nticipation requires the disclosure in a single prior art reference of each element of the claim under consideration.” *W. L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983). Therefore, every claimed feature of the claimed invention must be represented in the applied reference to constitute a proper rejection under 35 U.S.C. § 102(b).

In the present case, not every feature of the claimed invention is represented in the *Feenstra* reference. Applicants discuss the *Feenstra* reference and Applicants’ claims in the following.

(1) Claims 1-6, 9 and 31-33

Claim 1, as amended, recites, “wherein the nanofiller particulates are dispersed within the build material at from 0.1 wt% to 20 wt%.” *Feenstra* does not teach or suggest this feature. As such, *Feenstra* does not teach each and every element of claim 1 and for at least this reason, the rejection of claim 1 should be withdrawn.

The feature from claim 10 regarding the wt% of the nanofiller particulates in the build material has been amended into claim 1 herein, and so Applicants also address the rejection of claim 10 under 35 U.S.C. 103(a) here. Specifically, the Examiner stated the following:

one of ordinary skill in the art at the time of the invention would have been motivated to determine the optimum weight percent of the particles to provide the desired viscosity for a particular dispensing technique and the desired thickness for three-dimensional accuracy, wherein the claimed 20% is close enough to the disclosed “preferred” 25% taught by *Feenstra* to have been obvious to one having ordinary skill in the art at the time of the invention.

Office Action at 4. Applicants disagree that the presently claimed ranges are “close enough” to be rendered obvious by the teaching of the 25 to 60 wt%. In order to arrive at the highest of the presently claimed range, 20 wt%, the highest end of the range in *Feenstra* (to compare the comparable end portions of the ranges) would have to be lowered by 40%. Such a variation,

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especially in light of the fact that the only range taught by *Feenstra* has a lower limit of 25%, which is still 5% higher than the highest claimed range, would not be obvious.

Also, the range recited in claim 1 is drawn to the amount of nanofiller dispersed in the build material, or in other words, the weight percentage is based on the build material and the nanofiller only. In contrast to this, the ranges taught by *Feenstra* are described as being “based on the weight of the dispersion.” In order to qualify as a build material, the *Feenstra* dispersion must include a monomeric solution. The monomeric solution is defined to be “a mixture of UV photopolymerizable monomers in a solvent suitable therefore.” As such, the ranges are not analogous in their defined coverage.

The Examiner further alleges that one skilled in the art would be motivated to optimize the range based on a desire to provide a viscosity for a particular dispensing technique or desired thickness for three-dimensional accuracy. Such an assertion lacks support in both *Feenstra* and the present application. Nowhere in either *Feenstra* or the present application is there any teaching or suggestion that varying the percentages of nanofiller material in the build material can vary the viscosity or three-dimensional accuracy of the systems. On the contrary, *Feenstra* teaches that the disclosed “preferred” ranges can in fact be ink-jetted using piezo inkjet printer, implying that the viscosity does not need to be modified for it to be jetted. Additionally, the present application teaches various techniques for modifying viscosity or other jetting properties such as heat to liquefy the material and/or liquid modifiers such as water, surfactants, organic solvents, etc.; however, none of the taught techniques include adjusting the amount of nanofiller.

In light of the foregoing, no motivation exists for one skilled in the art to alter the cited reference in the manner recited in claim 1. Therefore, *Feenstra* does not teach or suggest all of the features of claim 1.

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Because independent claim 1 is allowable over the cited art, dependent claims 2-6, 9, and 31-33 are allowable as a matter of law for at least the reason that the dependent claims 2-6, 9, and 31-33 contain all elements of their base claim 1. *See, e.g., In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). In addition, and notwithstanding the foregoing allowability of independent claim 1, the dependent claims recite further features and/or combinations of features (as is apparent by examination of the claim themselves) that are patentably distinct from the prior art of record. Hence, there are other reasons why the dependent claims are allowable. For example, dependent claim 31 recites "wherein the build material includes an epoxy material and the curing system includes a material having a functional group chosen from at least one of the following: amino, hydroxyl, and carboxyl." Dependent claim 32 recites "wherein the build material includes a polyisocyanate material and the curing system includes a polyol material." Dependent claim 33 recites "wherein the build material includes functionalized silicone material and the curing system includes a material reactive with silicone." These features are not taught or suggested by the cited art.

(2) Claims 11-13

Claim 11, as amended, recites, "wherein the nanofiller particulates are selected from the group consisting of hydroxyapatite, organic-inorganic hybrid nanocomposites, curable liquid crystals, and combinations thereof." *Feenstra* does not teach or suggest any of these nanofillers. Instead, *Feenstra* discloses only the following nanomeric, inorganic solid particles:

ZnO, CdO, SiO₂, TiO₂, ZrO₂, CeO₂, SnO₂, Al₂O₃, In₂O₃, La₂O₃, Fe₂O₃, Cu₂O, Ta₂O₅, Nb₂O₅, V₂O₅, MoO₃, WO₃, CdS, ZnS, PbS, Ag₂S, GaSe, CdSe, ZnSe, ZnTe, CdTe, AgCl, AgBr, AgI, CuCl, CuBr, CdI₂, PbI₂, CdC₂, SiC, AlAs, GaAs, GeAs, InSb, BN, AlN, Si₃N₄, Ti₃N₄, GaP, InP, Zn₃P₂, Cd₃P₂, phosphates, silicates, zirconates, aluminates, stannates and corresponding mixed oxides (as with a perovskite structure, e.g. BaTiO₃ and PbTiO₃). Preferred are materials comprising oxides, sulfides, selenides or tellurides of metals, or mixtures thereof.

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Preferred in particular are nanomeric particles of SiO_2 , TiO_2 , ZrO_2 , ZnO , Ta_2O_5 , SnO_2 and Al_2O_3 (in all forms, in particular as boehmite, $\text{AlO}(\text{OH})$) and mixtures thereof.

Feenstra at col. 3, lines 1-14. None of these read on or render obvious a nanofiller of a hydroxyapatite, organic-inorganic hybrid nanocomposites, curable liquid crystals, or combinations thereof, as recited in claim 11. As such, *Feenstra* does not teach each and every element of claim 11 and for at least this reason, the rejection of claim 11 should be withdrawn.

Because independent claim 11 is allowable over the cited art, dependent claims 12 and 13 are allowable as a matter of law for at least the reason that the dependent claims 12 and 13 contain all elements of their base claim 11. In addition, and notwithstanding the foregoing allowability of independent claim 11, the dependent claims recite further features and/or combinations of features (as is apparent by examination of the claim themselves) that are patentably distinct from the prior art of record. Hence, there are other reasons why the dependent claims are allowable. For example, dependent claim 12 recites "wherein the nanofiller particulates are inorganic nanoparticulates of hydroxyapatite." Dependent claim 13 recites "wherein the nanofiller particulates are organic-inorganic hybrid nanocomposites selected from the group consisting of montmorillonite organo-clay, PMMA-clay nanocomposites, epoxy-clay nanocomposites, PMMA-co-MMA clay nanocomposites, starch-clay nanocomposites, and combinations thereof." These features are not taught or suggested by the cited art. The Examiner alleges that the portion of *Feenstra* cited above reads upon clay. Applicants disagree that the specific nanofillers recited in claim 13 are anticipated by the nanomeric particles of *Feenstra*. The Office relies on an initiator in *Feenstra* being added to the flowable mass, wherein particularly preferred polymerizable and/or polycondensable groups are (meth)acryl and

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epoxy groups. However, it should be noted that the initiator of Feenstra is not a nanofiller particulate, as recited in claim 13.

Due to the shortcomings of the *Feenstra* reference described in the foregoing, Applicants respectfully assert that *Feenstra* does not anticipate Applicants' claims. Therefore, Applicants respectfully request that the rejection of these claims be withdrawn.

Claim Rejections - 35 U.S.C. § 103(a)

Claims 7-8, 10, and 14 have been rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over *Feenstra*. Applicants respectfully traverse this rejection.

As has been acknowledged by the Court of Appeals for the Federal Circuit, the U.S. Patent and Trademark Office ("USPTO") has the burden under section 103 to establish a *prima facie* case of obviousness by showing some objective teaching in the prior art or generally available knowledge of one of ordinary skill in the art that would lead that individual to the claimed invention. *See In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). The Manual of Patent Examining Procedure (MPEP) section 2143 discusses the requirements of a *prima facie* case for obviousness. That section provides as follows:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teaching. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and reasonable expectation of success must be found in the prior art, and not based on applicant's disclosure.

In the present case, the *prima facie* case of obviousness has not been met.

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(1) Claims 7-8 and 10

Claims 7-8 and 10 depend from claim 1. As noted above, claim 1 recites “wherein the nanofiller particulates are dispersed within the build material at from 0.1 wt% to 20 wt%”. This feature is not only not taught, but is also not suggested by *Feenstra*. Therefore, for at least this reason, the rejection of claims 7-8 and 10 should be withdrawn. In addition, and notwithstanding the foregoing allowability of independent claim 1, the dependent claims recite further features and/or combinations of features (as is apparent by examination of the claim themselves) that are patentably distinct from the prior art of record. Hence, there are other reasons why the dependent claims are allowable.

(2) Claim 14

Claim 14 depends from claim 11. As noted above, claim 11 recites nanofiller particulates that are not only not taught, but are also not suggested by *Feenstra*. Therefore, for at least this reason, the rejection of claim 14 should be withdrawn. In addition, and notwithstanding the foregoing allowability of independent claim 11, claim 14 recites further features and/or combinations of features (as is apparent by examination of the claim themselves) that are patentably distinct from the prior art of record. Hence, there are other reasons why claim 14 is allowable.

For example, claim 14 as amended recites, “wherein the nanofiller particulates are curable liquid crystals selected from the group consisting of low viscosity oligomeric liquid crystals, reactive monomeric liquid crystals, and combinations thereof.” *Feenstra* does not teach or suggest any of these nanofillers.

The Office admits that *Feenstra* does not specifically teach that its nanomeric particles are liquid crystal nanoparticles as recited in claim 14. See *Office Action* at 4. Instead, the Office

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alleges that in the absence of a showing of unexpected results, it would have been obvious to one having ordinary skill in the art to utilize any reactive monomer or nanomer including in liquid crystal form as claimed. *Id.* at 4-5. It would not be obvious to utilize a reactive species in liquid crystal due to the possible affect of using a liquid crystal additive upon the viscosity of the build composition or the cure agent. Having the correct viscosity can be important in certain types of solid freeform printing, for example, in an inkjet printing dispensing system. The originally-filed specification states the following:

In accordance with other aspects of the invention, the build material can be configured to be jettable from ink-jet architecture. As such, in one embodiment, the build material can, in preparation for jetting, be brought to a viscosity which is less than 70 cP, and a temperature less than 200°C. Either thermal ink-jet pens or piezo ink-jet pens can be used. In a more detailed aspect, a viscosity near 15 cP has been found to be desirable in some circumstances. As is known in the art, the viscosity of a fluid can generally be lowered by increasing its temperature. As the build material (or other jettable material, such as curing agent or support material, etc.) is used to form solid objects, the use of higher temperatures can allow more viscous higher molecular weight materials to be used, which can provide for increased toughness of the solid three-dimensional object upon cooling. In addition to the heating option, the viscosity of a fluid can also be lowered by adding low molecular weight monomers and oligomers, and/or by adding small amounts of liquid modifier.

Specification at page 9, lines 10-23. As clear from the foregoing, viscosity plays a role in the jettability of the build material from the ink-jet architecture. Therefore, adding particulates such as liquid crystals that might affect the viscosity would not be obvious to one of ordinary skill in the art. Therefore, for at least this reason also, claim 14 recites nonobvious features over *Feenstra*.

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In summary, it is Applicants' position that a *prima facie* for obviousness has not been made against Applicants' claims. Therefore, it is respectfully submitted that each of these claims is patentable over *Feenstra* and that the rejection of these claims should be withdrawn.

New Claims

Claims 31-36 have been newly added to further define and/or clarify the scope of the invention. Claims 31-33 are allowable for at least the reason that they depend from claim 1, which is believed to be allowable for at least the reasons cited above. Claims 33-36 are allowable for at least the reason that they recite nanofiller particulates that are not taught or disclosed in the prior art in conjunction with the claimed solid free-form fabrication systems.

Prior Art Made of Record

The prior art made of record has been considered, but is not believed to affect the patentability of the presently pending claims.

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CONCLUSION

In light of the foregoing amendments and for at least the reasons set forth above, Applicants respectfully submit that all objections and/or rejections have been traversed, rendered moot, and/or accommodated, and that the now pending claims are in condition for allowance. Favorable reconsideration and allowance of the present application and all pending claims are hereby courteously requested.

Any other statements in the Office Action that are not explicitly addressed herein are not intended to be admitted. In addition, any and all findings of inherency are traversed as not having been shown to be necessarily present. Further, any and all findings of well-known art and official notice, or statements interpreted similarly, should not be considered well known for at least the specific and particular reason that the Office Action does not include specific factual findings predicated on sound technical and scientific reasoning to support such conclusions.

If, in the opinion of the Examiner, a telephone conference would expedite the examination of this matter, the Examiner is invited to call the undersigned attorney at (770) 933-9500.

Respectfully submitted,



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